



MSE STRUCTURE SHOP DRAWINGS
PREPARED FOR

I-405; RENTON TO BELLEVUE WIDENING AND
EXPRESS TOLL LANES PROJECT - WALL 12.18
KING COUNTY, WASHINGTON

Tensar.

Tensar International Corporation
2500 Northwinds Parkway | Suite 500
Alpharetta, Georgia 30009 | 770-344-2090

C.O.A. NO. 2465

THIS DESIGN IS BASED UPON SPECIFIC PROPERTIES OF THOSE SPECIFIC TENSAR PRODUCTS INCORPORATED THEREIN WHICH ARE PROPRIETARY TO TENSAR. ANY SUBSTITUTION OF THE SPECIFIED PRODUCTS WILL INVALIDATE THIS DESIGN. THIS DRAWING IS BEING FURNISHED FOR USE ON THIS SPECIFIC PROJECT ONLY. ANY PARTY ACCEPTING THIS DOCUMENT DOES SO IN CONFIDENCE AND AGREES THAT IT SHALL NOT BE DUPLICATED WHOLE OR IN PART, NOR DISCLOSED TO OTHERS, WITHOUT THE CONSENT OF TENSAR INTERNATIONAL CORPORATION.

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PROJECT NAME AND LOCATION
**I-405; RENTON TO
BELLEVUE WIDENING AND
EXPRESS TOLL LANES
PROJECT - WALL 12.18**
KING COUNTY, WA

OWNER
WSDOT
OWNER PROJECT No. C9242
CLIENT
FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
336-830-0226

TIC PROJECT No. O38650
DRAWN BY: O. MARTINEZ
DESIGNED BY: V. AMAYA
CHECKED BY: R. JOHNSON
ENGINEER OF RECORD (MSE STRUCTURE ONLY):
JONG LEE P.E. NO. 53995

2	12/8/2021	NO CHANGES	VA
1	11/11/2021	NO CHANGES	VA
0	10/12/2021	ISSUED FOR REVIEW	VA
NO.	DATE	DESCRIPTION	BY

REVISION / ISSUE

SHEET TITLE
TITLE SHEET

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I-405, Renton to Bellevue Widening & and Express Toll Lanes Project

DOCUMENT REVIEW

- ☒ APPROVED, NO EXCEPTION TAKEN
☐ APPROVED AS NOTED
☐ RESUBMIT, REVISE AS NOTED

REVIEWED BY: E. Ferluga DATE: 12/10/21

B. Exley 12/10/21

Review is for general conformance with contract or design documents. Sole responsibility for correctness of dimensions, details, quantities, materials, and safety during fabrication and erection shall remain with the contractor.

Plotted on: December 8, 2021
K:_D38650\FINAL WORKING FILES\DRAWINGS\REV2\D38650_CR.DWG

DESIGN CRITERIA AND CONSTRUCTION REQUIREMENTS
PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA

1.0 PROJECT INTRODUCTION

1.1 THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA WALL SYSTEM FOR THE I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT – WALL 12.18 PROJECT IS A MECHANICALLY STABILIZED EARTH (MSE) STRUCTURE. THE DRAWINGS AND ASSOCIATED ANALYSES ARE PRESENTED BY TENSAR INTERNATIONAL CORPORATION (TIC) TO FLATIRON-LANE J.V. (CLIENT) UNDER CONTRACT.

2.0 MATERIALS

2.1 BACKFILL

2.1.1 BACKFILL (REINFORCED AND RETAINED ZONES) SHALL BE FREE OF EXCESS MOISTURE, ROOTS, MUCK, SOD, SNOW, FROZEN LUMPS, ORGANIC MATTER OR OTHER DELETERIOUS MATERIALS. ALL ROCK PARTICLES AND HARD EARTH CLODS SHALL BE LESS THAN 4 INCHES IN THE LONGEST DIMENSION. BACKFILL WHICH DOES NOT MEET THESE CRITERIA SHALL BE CONSIDERED UNSUITABLE AND SHALL BE REMOVED.

2.1.2 REINFORCED BACKFILL SHALL BE ON-SITE OR IMPORT SOILS THAT MEET THE STRENGTH REQUIREMENTS DEFINED IN SECTION 4.2 AND THE WSDOT STANDARD SPECIFICATIONS FOR GRAVEL BORROW OR GRAVEL BACKFILL FOR WALLS.

2.2 SOIL REINFORCEMENT

GEOGRID REINFORCEMENT SHALL BE SYNTEEN GEOGRIDS SUPPLIED BY TENSAR INTERNATIONAL CORPORATION, MORROW, GEORGIA, USA.

2.3 FACING MATERIAL

2.3.1 WELDED WIRE FORMS (WWF) SHALL BE SUPPLIED BY TENSAR INTERNATIONAL CORPORATION, MORROW, GEORGIA, USA.

2.3.2 GEOTEXTILE SHALL MEET THE SPECIFICATION FOR AASHTO M288 GEOTEXTILES, AS NOTED IN THE DETAILS.

3.0 DESIGN RESPONSIBILITY

3.1 TIC RESPONSIBILITY

TIC HAS DESIGNED THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA SYSTEM TO SATISFY THE MSE CHARACTERISTICS LISTED BELOW.

INTERNAL STABILITY	STATIC	SEISMIC
GEOGRID TENSILE STRENGTH, MINIMUM CDR	1.0	1.0
GEOGRID PULLOUT CAPACITY, MINIMUM CDR	1.0	1.0
SLIDING AT LOWEST GEOGRID, MINIMUM CDR	1.0	1.0
EXTERNAL STABILITY	STATIC	SEISMIC
SLIDING AT MSE BASE, MINIMUM CDR	1.0	1.0
ECCENTRICITY AT MSE BASE, MAXIMUM	0.25	0.40
COMPOUND STABILITY, MINIMUM FS	1.0	1.0
COMPOUND STABILITY	STATIC	SEISMIC
OVERALL STABILITY, ϕ	0.75	0.9
PULLOUT AND TENSILE RESISTANCE, ϕ	0.9	1.2

PARTIAL FACTORS IN ACCORDANCE WITH AASHTO LRFD. TARGET OF 1.0 PER GDM SECTION 15-5.34

3.2 THE SITE CHARACTERISTICS LISTED BELOW AFFECT THE PERFORMANCE OF THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA SYSTEM. TIC IS NOT RESPONSIBLE FOR EVALUATING OR VERIFYING SITE CHARACTERISTICS; THEREFORE TIC ASSUMES NO LIABILITY FOR THE POTENTIAL NEGATIVE EFFECTS OF THE SITE CHARACTERISTICS. THE CLIENT IS RESPONSIBLE FOR ENSURING THAT A QUALIFIED ENGINEER PROPERLY ADDRESSES THE FOLLOWING SITE CHARACTERISTICS.

3.2.1 TIC REPORTS PHYSICAL AND STRENGTH REQUIREMENTS OF THE BACKFILL. THE CLIENT IS RESPONSIBLE FOR VERIFICATION OF BACKFILL SPECIFICATIONS AND APPROPRIATE BACKFILL TESTING METHODS AND FREQUENCY.

3.2.2 BEARING RESISTANCE

THE APPLIED BEARING PRESSURE HAS BEEN CALCULATED FOR EACH DESIGN CASE IN THE CALCULATION PACKAGE REFERENCED IN SECTION 7.1. THE CLIENT IS RESPONSIBLE FOR ENSURING THAT A QUALIFIED GEOTECHNICAL ENGINEER PERFORMS AN EVALUATION OF THE FOUNDATION AND ITS BEARING RESISTANCE. THE CLIENT IS RESPONSIBLE TO NOTIFY TIC IF THE MAXIMUM APPLIED BEARING PRESSURE EXCEEDS THE BEARING RESISTANCE.

3.2.3 HYDROSTATIC CONDITIONS

TIC REPORTS MAXIMUM DESIGN WATER LEVELS (SURFACE AND SUBSURFACE) IN SECTION 4.6. TIC REQUIRES THAT THE REINFORCED ZONE OF THE MSE STRUCTURE REMAINS FREE OF WATER AND ALL UNBALANCED HYDROSTATIC FORCES. THE CLIENT IS RESPONSIBLE FOR ENSURING THAT THE DESIGN, ANALYSIS, DETAILING, AND MITIGATION OF SURFACE WATER AND SUBSURFACE WATER, INCLUDING BUT NOT LIMITED TO COLLECTION, DIVERSION, AND EROSION/SCOUR PROTECTION ARE PROPERLY ADDRESSED BY A QUALIFIED ENGINEER.

3.2.4 SETTLEMENT

TOTAL SETTLEMENT AND DIFFERENTIAL SETTLEMENT OF THE MSE STRUCTURE EXCEEDING 1/50 SHALL BE THE RESPONSIBILITY OF THE CLIENT. THE CLIENT IS RESPONSIBLE TO NOTIFY TIC IF IT IS DETERMINED THAT THE POTENTIAL FOR DIFFERENTIAL SETTLEMENT EXCEEDS THIS VALUE. TIC ACCEPTS NO LIABILITY OR RESPONSIBILITY FOR THE EVALUATION OF SETTLEMENT.

3.2.5 GLOBAL STABILITY

GLOBAL STABILITY IS OUTSIDE THE SCOPE OF TIC'S RESPONSIBILITY FOR THE PROJECT. THE CLIENT IS RESPONSIBLE FOR ENSURING THAT THE SOILS BEHIND AND BELOW THE MSE STRUCTURES ARE CAPABLE OF RESISTING ROTATIONAL AND WEDGE-SHAPED FAILURE.

4.0 DESIGN PARAMETERS

4.1 DESIGN OF THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA IS BASED ON "AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS", 8TH EDITION AND THE WSDOT GEOTECHNICAL DESIGN MANUAL THE FOLLOWING PARAMETERS CONTROL THE DESIGN:

4.2 SOIL PARAMETERS

SOIL ZONE	MOIST UNIT WEIGHT (PCF)	EFFECTIVE FRICTION ANGLE (DEGREES)	EFFECTIVE COHESION (PSF)
REINFORCED ZONE	135	38	0
RETAINED ZONE	135	38	0
FOUNDATION ZONE	140	43	0

NOTE: THE SOIL PARAMETERS LISTED ABOVE WERE PROVIDED IN REFERENCE 7.2.1. THE PROJECT GEOTECHNICAL ENGINEER SHALL CONFIRM THE APPROPRIATENESS OF THE PARAMETERS ABOVE.

4.3 GEOGRID

GEOGRID TENSILE PROPERTIES AND REDUCTION FACTORS USED FOR THE CALCULATIONS REFERENCED IN SECTION 7.1 ARE LISTED BELOW.

GEOGRID TYPE	ULTIMATE TENSILE STRENGTH, T_{ULT}	REDUCTION FACTORS			ALLOWABLE DESIGN STRENGTH, T_{AL} (lb/ft)
		CREEP, R_{CR}	INSTALLATION DAMAGE, R_{ID}	DURABILITY, R_{FD}	
SF90	9000	1.51	1.11	1.30	4130
SF180	14500	1.51	1.11	1.30	6654

4.3.1 SOIL-GEOGRID INTERACTION COEFFICIENT (PULLOUT), C_i = 0.67

4.3.2 SOIL-GEOGRID INTERACTION COEFFICIENT (DIRECT SLIDING), C_{ds} = 0.8

4.3.3 GEOGRID COVERAGE RATIO, R_c = 1.0

4.4 DESIGN LIFE

= 75 YEARS

4.5 LOADINGS

4.5.1 TRAFFIC SURCHARGE = 250 PSF

4.5.2 LOADING TABLE PER CONTRACT PLANS BRIDGE SHEET NO. BR5. REFER TO CALCULATIONS PACKAGE FOR LOADING CONDITIONS FOR DESIGN CASES.

4.5.3 SEISMIC ACCELERATION COEFFICIENT, K_h = 0.247 g

4.6 PHREATIC SURFACES WERE NOT CONSIDERED IN DESIGN OF THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA SYSTEM. WATER LEVELS (SURFACE AND SUBSURFACE) SHALL REMAIN SUFFICIENTLY BELOW THE BOTTOM OF THE STRUCTURES ($> H$, HEIGHT OF MSE STRUCTURE) FOR THE LIFE OF THE STRUCTURE TO PRECLUDE NEGATIVES EFFECTS ON THE INTERNAL OR EXTERNAL STABILITY OF THE STRUCTURES.

5.0 CONSTRUCTION

5.1 A COMPLETE SET OF APPROVED SHOP DRAWINGS AND CONTRACT SPECIFICATIONS SHALL BE ON SITE AT ALL TIMES DURING CONSTRUCTION OF THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA SYSTEM. THE CONTRACTOR IS RESPONSIBLE TO FOLLOW THE DRAWINGS AND THE INSTRUCTIONS PROVIDED IN THE CONSTRUCTION AND QUALITY CONTROL MANUAL PROVIDED BY TIC.

5.2 FOUNDATION PREPARATION

PRIOR TO CONSTRUCTION OF THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA SYSTEM, THE CONTRACTOR SHALL CLEAR AND GRUB THE REINFORCED BACKFILL FOOTPRINT, REMOVING TOP SOIL, BRUSH, SOD OR OTHER ORGANIC OR DELETERIOUS MATERIAL. ANY UNSUITABLE SOILS SHALL BE OVER-EXCAVATED, REPLACED WITH COMPACTED BACKFILL MATERIAL TO PROJECT SPECIFICATIONS OR AS OTHERWISE DIRECTED BY A QUALIFIED GEOTECHNICAL ENGINEER. THE FOUNDATION SHALL BE PROOF ROLL INSPECTED USING A LOADED TRUCK WITH 18 KIP AXLE LOADS OR PER PROJECT SPECIFICATIONS. THE CLIENT IS RESPONSIBLE TO HAVE A QUALIFIED GEOTECHNICAL ENGINEER CONFIRM THAT THE FOUNDATION HAS BEEN PROPERLY PREPARED AND MEETS THE SOIL PARAMETERS STATED IN SECTION 4.2.

5.3 MSE FACING

5.3.1 THE CLIENT IS RESPONSIBLE TO SURVEY AND LAYOUT THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA FACING AS SHOWN ON THE OWNER'S CONTRACT DRAWINGS.

5.3.2 INSTALL WWF FACING UNITS ON LEVEL GRADE. ENDS OF ADJACENT FACING UNITS SHALL BE OVERLAPPED 4.0 INCHES. ATTACH THE END VERTICAL WIRES OF ADJACENT FACING UNITS WITH CABLE TIES OR TIE WIRES TO MAINTAIN ALIGNMENT AND CONTAIN FILL. FACING UNIT BATTER SHOWN HEREIN SHALL BE MAINTAINED DURING CONSTRUCTION. THE CLIENT SHALL PROVIDE ALIGNMENT CONTROL FOR EACH COURSE OF FACING UNITS AND MAKE ALIGNMENT CORRECTIONS AS NECESSARY. HORIZONTAL DEFORMATION OF INDIVIDUAL FACING UNITS (BULGING) SHALL BE LIMITED TO 2.0 INCHES BETWEEN STRUTS AND BETWEEN THE BASE AND TOP OF THE FACING UNIT. THE CLIENT SHALL MODIFY COMPACTION PROCEDURES IF EXCESSIVE DEFORMATION OF THE FACING UNIT OCCURS. ADDITIONAL STRUTS MAY BE USED TO STIFFEN THE FACING UNIT.

5.4 GEOGRID PLACEMENT

5.4.1 GEOGRIDS SHALL BE INSTALLED AT THE LENGTHS, ELEVATIONS, AND LOCATIONS SHOWN ON THE DRAWINGS HEREIN. CHANGES TO GEOGRID LAYOUT ARE NOT PERMISSIBLE WITHOUT THE EXPRESS WRITTEN CONSENT OF TIC.

5.4.2 GEOGRID REINFORCEMENT SHALL BE CONTINUOUS THROUGHOUT THEIR EMBEDMENT LENGTH. GEOGRID-TO-GEOGRID CONNECTION IS NOT ALLOWED.

5.4.3 GEOGRID SHALL BE ROLLED OUT PERPENDICULAR TO THE FACING UNITS UNLESS OTHERWISE NOTED.

5.4.4 TRACKED CONSTRUCTION EQUIPMENT SHALL NOT BE OPERATED DIRECTLY ON THE GEOGRID REINFORCEMENT. A MINIMUM BACKFILL THICKNESS OF 6 INCHES IS REQUIRED FOR OPERATION OF TRACKED VEHICLES OVER THE GEOGRID REINFORCEMENT. TURNING OF TRACKED VEHICLES SHOULD BE KEPT TO A MINIMUM TO PREVENT TRACKS FROM DISPLACING THE FILL AND/OR GEOGRID REINFORCEMENT. RUBBER-TIRED VEHICLES MAY PASS OVER THE GEOGRID REINFORCEMENT AT SPEEDS LESS THAN 10 MPH. SUDDEN BRAKING AND SHARP TURNING SHALL BE AVOIDED.

5.4.5 A MINIMUM OF 3 INCHES OF REINFORCED BACKFILL SHALL BE PLACED BETWEEN OVERLAPPING LAYERS OF GEOGRID REINFORCEMENT.

5.5 BACKFILL PLACEMENT

5.5.1 PRIOR TO PLACING BACKFILL, POSITION THE FACE BACKING AND INSTALL THE WIRE STRUTS AS SHOWN IN THE DRAWINGS. BACKFILL AND FACE FILL SHALL BE PLACED IN ALTERNATING LIFTS. THE GEOGRID SHALL BE TENSIONED BY HAND TO ELIMINATE SLACK AND ANCHORED BY PINNING OR PLACING SOIL ON THE GEOGRID AT THE BACK OF THE REINFORCED ZONE. BACKFILL SHALL BE PLACED IN HORIZONTAL LAYERS NOT EXCEEDING 10 INCHES OR 6 INCHES IN UNCOMPACTED THICKNESS FOR HEAVY OR LIGHTWEIGHT COMPACTION EQUIPMENT RESPECTIVELY. ONLY LIGHTWEIGHT EQUIPMENT SHALL BE ALLOWED WITHIN 3 FEET OF THE BACK FACE OF THE MSE STRUCTURE.

5.5.2 BACKFILL SHALL BE PLACED FROM THE BACK OF THE MSE STRUCTURE FACING (WWF UNIT) TOWARDS THE ENDS OF THE GEOGRID TO PROMOTE PROPER TENSIONING.

5.5.3 BACKFILL SHALL BE PLACED AND COMPACTED IN ACCORDANCE WITH WSDOT STANDARD SPECIFICATION SECTION 6-13.3(7).

5.5.4 AT THE END OF EACH WORKDAY, BACKFILL SURFACE SHALL BE GRADED AWAY FROM THE WALL FACE. THE BACKFILL SURFACE SHALL BE COMPACTED WITH A SMOOTH DRUM ROLLER TO MINIMIZE PONDING OF WATER AND SATURATION OF THE BACKFILL. A TEMPORARY SOIL BERM SHALL BE CONSTRUCTED NEAR THE CREST OF THE MSE STRUCTURE TO PREVENT SURFACE WATER RUNOFF FROM OVERTOPPING THE MSE STRUCTURE.

6.0 SPECIAL PROVISIONS

6.1 THE DESIGN PRESENTED HEREIN IS ONLY VALID FOR THE PERMANENT GEOSYNTHETIC RETAINING WALL WITH CAST-IN-PLACE CONCRETE FASCIA FOR THE I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT – WALL 12.18 PROJECT. THE DESIGN IS BASED ON SOIL PARAMETERS, FOUNDATION CONDITIONS, GROUNDWATER CONDITIONS, AND LOADINGS STATED IN SECTION 4.0. TIC ASSUMES NO LIABILITY FOR INTERPRETATION OR VERIFICATION OF SUBSURFACE CONDITIONS, FOR SUITABILITY OF SOIL DESIGN PARAMETERS OR FOR INTERPRETATION OF SUBSURFACE GROUNDWATER CONDITIONS. THE CLIENT IS RESPONSIBLE TO VERIFY THAT ACTUAL SITE CONDITIONS, PARAMETERS, AND STRUCTURE GEOMETRIES ARE AS DESCRIBED HEREIN PRIOR TO AND DURING CONSTRUCTION. PROCEEDING WITH CONSTRUCTION WITHOUT FIRST VERIFYING CONDITIONS AND PARAMETERS DISCUSSED ABOVE SHALL ABSOLVE TIC FROM ALL LIABILITY FOR THE DESIGN AND CONSTRUCTION OF THIS STRUCTURE AND THE CONTRACTOR SHALL INDEMNIFY AND HOLD HARMLESS TIC FROM ALL RESULTING CLAIMS, DAMAGES, LOSSES AND EXPENSES.

6.2 THE CLIENT IS RESPONSIBLE FOR PROVIDING QUALITY ASSURANCE AND QUALITY CONTROL PROGRAMS THAT ENSURE CONSTRUCTION OF THE MSE STRUCTURE IS PERFORMED IN ACCORDANCE WITH THE TIC NOTES AND DRAWINGS, AND THE OWNER'S CONTRACT PLANS AND SPECIFICATIONS.

6.3 THE CLIENT SHALL IMMEDIATELY REPORT ANY CHANGES TO TIC (770-344-2090) PRIOR TO PROCEEDING WITH CONSTRUCTION. THE CLIENT SHALL IMMEDIATELY REPORT TO TIC THE DISCOVERY OF ANY ROCK FORMATIONS AND/OR GROUNDWATER DURING CONSTRUCTION.

6.4 TIC IS NOT RESPONSIBLE FOR HAVING PERSONNEL ON-SITE UNLESS SPECIFICALLY PROVIDED FOR IN A WRITTEN CONTRACT SIGNED BY TIC. ANY TIC REPRESENTATIVE ON SITE DOES NOT HAVE THE AUTHORITY TO STOP OR START CONSTRUCTION OF THE MSE STRUCTURE OR ANY OTHER WORK.

7.0 REFERENCE DOCUMENTS

7.1 THE DESIGN CALCULATIONS PREPARED BY TIC ARE SUBMITTED UNDERS A SEPARATE COVER AND HAVE BEEN DATED DECEMBER 8, 2021.

7.2 THE FOLLOWING DOCUMENTS WERE USED TO PREPARE THE SHOP DRAWINGS AND CALCULATIONS.

7.2.1 "I-405 R2B GEOTECHNICAL RECOMMENDATIONS FOR BRIDGE 40P", PREPARED BY HART CROWSER, PREPARED FOR FLATIRON-LANE JOINT VENTURE, DATED OCTOBER 28, 2020.

7.2.2 CONTRACT PLANS FOR "I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT, PREPARED BY FLATIRON-LANE JOINT VENTURE, PREPARED FOR WSDOT, DATED APRIL 14, 2021.

7.2.3 RFI #406 PREPARED BY FLATIRON-LANE JV, PREPARED FOR WOOD ENVIRONMENT & INFRASTRUCTURE, INC. DATED JUNE 8, 2021 REGARDING LOADING CONDITIONS.

7.2.4 ERC WINGWALL LOADING PREPARED BY DAVID EVANS AND ASSOCIATES, INC., DATED AUGUST 31, 2021.

7.2.5 "BRIDGE 40P – SLOPE STABILITY ADDENDUM" FOR WSDOT I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT, PREPARED BY HART CROWSER, PREPARED FOR FLATIRON LANE JOINT VENTURE, DATED APRIL 8, 2021, RFC DATED APRIL 9, 2021.

DOCUMENT REVIEW

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☐ APPROVED AS NOTED

☐ RESUBMIT, REVISE AS NOTED

REVIEWED BY: E. Ferluga DATE: 12/10/21

B. Exley 12/10/21

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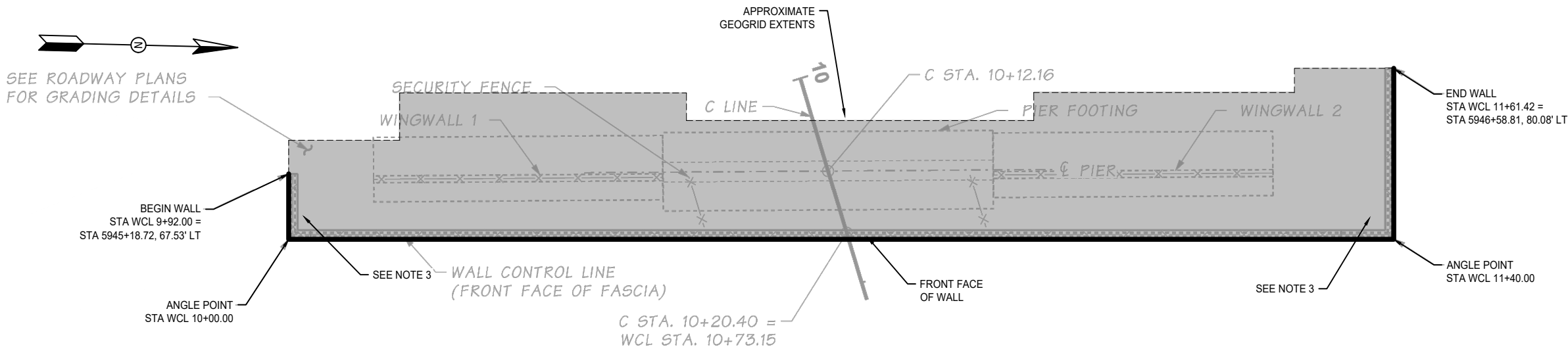
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**DESIGN CRITERIA AND
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SHEET 2 OF 9

Plotted on: December 8, 2021
K:_D\38650\FINAL\WORKING FILES\DRAWINGS\REV2\38650_PV.DWG



PLAN VIEW
NOT TO SCALE

NOTES:

1. PLAN VIEW SHOWN FOR ILLUSTRATIVE PURPOSES ONLY.
2. PLAN VIEW ADOPTED FROM CONTRACT PLANS TITLED "405/40P ERC BRIDGE OVER SB I-405, I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT", PLAN BRIDGE NO. BR5 PREPARED BY FLATIRON - LANE J.V., PREPARED FOR WASHINGTON STATE DEPARTMENT OF TRANSPORTATION, REVISION 1, NDC 052 - PIER WINGWALLS, DATED SEPTEMBER 27, 2021.
3. SEE GEOGRID PLACEMENT AT OUTSIDE CORNER DETAIL ON SHEET 9 OF 9.

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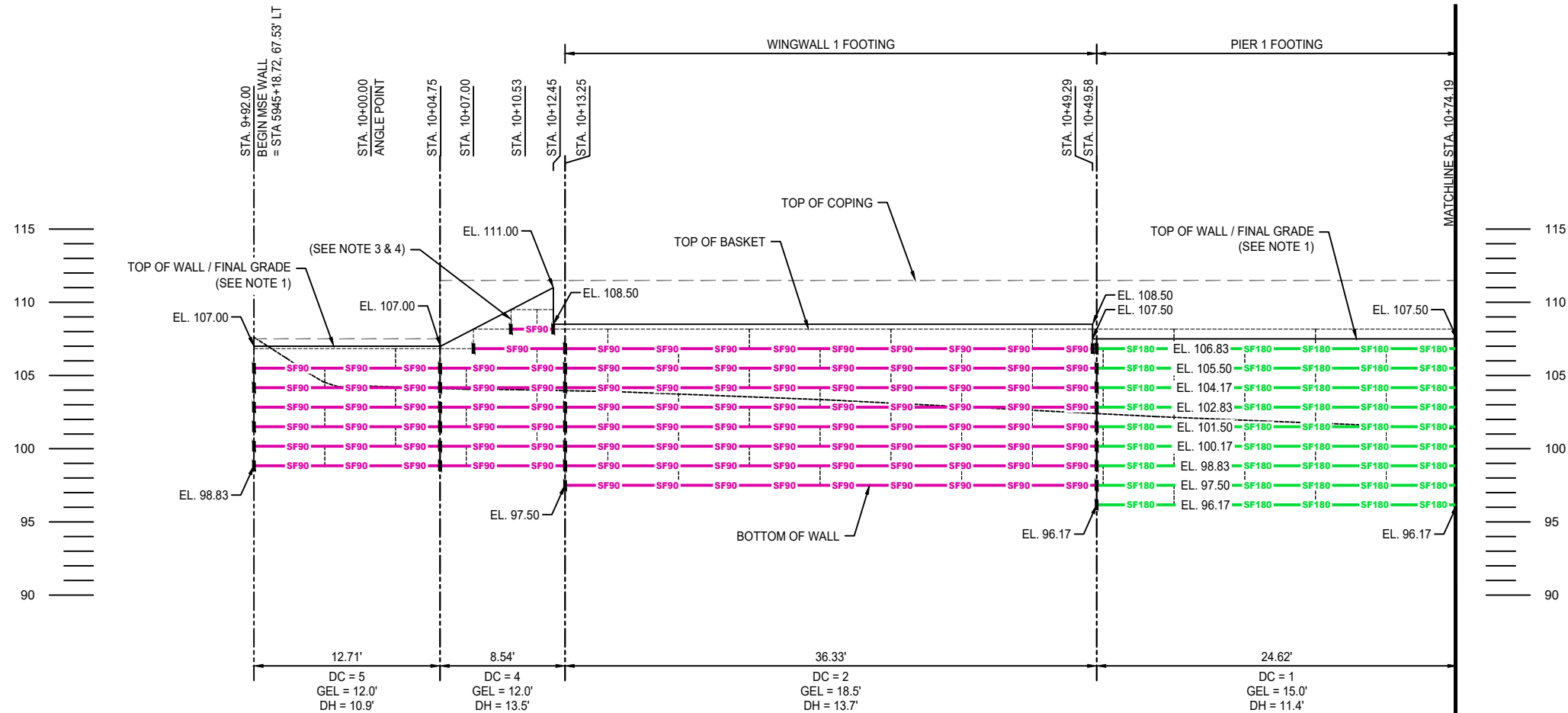
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DC = DESIGN CASE
GEL = GEOGRID EMBEDMENT LENGTH (FEET)
DH = DESIGN HEIGHT (FEET)

NOTES:

1. INSTALLER SHALL NEST FACING UNITS AT THE TOP OF MSE WALL TO MATCH THE PROPOSED FINISHED GRADE SHOWN. REFER TO NESTING BASKET DETAILS.
2. WALL GEOMETRY IS GENERATED BASED ON CONTRACT PLANS TITLED "I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT", BRIDGE SHEET NO. BR5, SHEET NO. 5. PROJECT ENGINEER SHALL VERIFY WALL GEOMETRY PRIOR TO CONSTRUCTION.
3. INSTALLER MAY TRIM WWF FACING UNITS 6" BELOW FINISHED GRADE LINE, MAINTAIN A MINIMUM OF 6" SOIL COVER ABOVE WWF FACING UNIT AND GEOSYNTHETICS OR INSTALLER MAY INSTALL WWF FACING UNITS AS SHOWN ABOVE AND AS SHOWN IN TOP OF MSE STRUCTURE FINISHING DETAIL.
4. RETURN FACING MATERIALS INTO FILL TO CONTAIN REINFORCED BACKFILL.
5. WWF FACING UNITS SHALL BE NESTED 2" TO ACHIEVE 16" GEOGRID SPACING. ADDITIONAL NESTING MAY BE REQUIRED AT THE TOP OF THE WALL TO ACCOMMODATE THE FINISHED GRADE SURFACE WHICH SHALL BE A 6" MINIMUM ABOVE WWF FACING UNITS AND GEOSYNTHETICS.

ELEVATION VIEW - WALL 12.18 (1 OF 2)

ALONG FRONT FACE OF MSE STRUCTURE

WALL DESIGN FACE AREA (FROM BOTTOM OF WALL TO TOP OF COPING)	2405 SF
---	---------

WELDED WIRE FORM FACING UNIT

FINISHED GRADE
APPROX. GEOGRID ELEVATION (FEET)

CHANGE IN EMBEDMENT LENGTH
OR GEOGRID TERMINATION

SYNTEEN SF90 GEOGRID

SYNTEEN SF180 GEOGRID



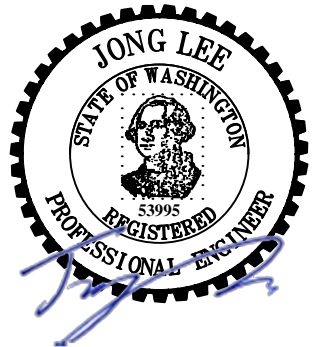
Tensor.

Tensor International Corporation
2500 Northwinds Parkway | Suite 500
Alpharetta, Georgia 30009 | 770-344-2090

C.O.A. NO. 2465

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PROJECT NAME AND LOCATION _____

**I-405; RENTON TO
BELLEVUE WIDENING AND
EXPRESS TOLL LANES
PROJECT - WALL 12.18**

KING COUNTY, WA

OWNER	WSDOT
-------	-------

OWNER PROJECT No. C9242

CLIENT

FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
336-830-0226

TIC PROJECT No. 038650

DRAWN BY: O. MARTINEZDESIGNED BY: V. AMAYA

CHECKED BY : R. JOHNSON

ENGINEER OF RECORD (MSE STRUCTURE ONLY):
JONG LEE P.E. NO. 53995

2	12/8/2021	NO CHANGES	VA
1	11/11/2021	REVISED PER COMMENTS	VA
0	10/12/2021	ISSUED FOR REVIEW	VA
NO.	DATE	DESCRIPTION	BY

SHEET TITLE

**ELEVATION VIEW -
WALL 12.18 (1 OF 2)**

SHEET 4 OF 9

Tensar.

Tensar International Corporation
2500 Northwinds Parkway | Suite 500
Alpharetta, Georgia 30009 | 770-344-2090

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PROJECT NAME AND LOCATION
**I-405; RENTON TO
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PROJECT - WALL 12.18**
KING COUNTY, WA

OWNER
WSDOT

OWNER PROJECT No. C9242

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FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
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REVISION / ISSUE

SHEET TITLE

**ELEVATION VIEW - WALL
12.18 (2 OF 2)**

SHEET 5 OF 9

I-405, Renton to Bellevue Widening & Express Toll Lanes Project

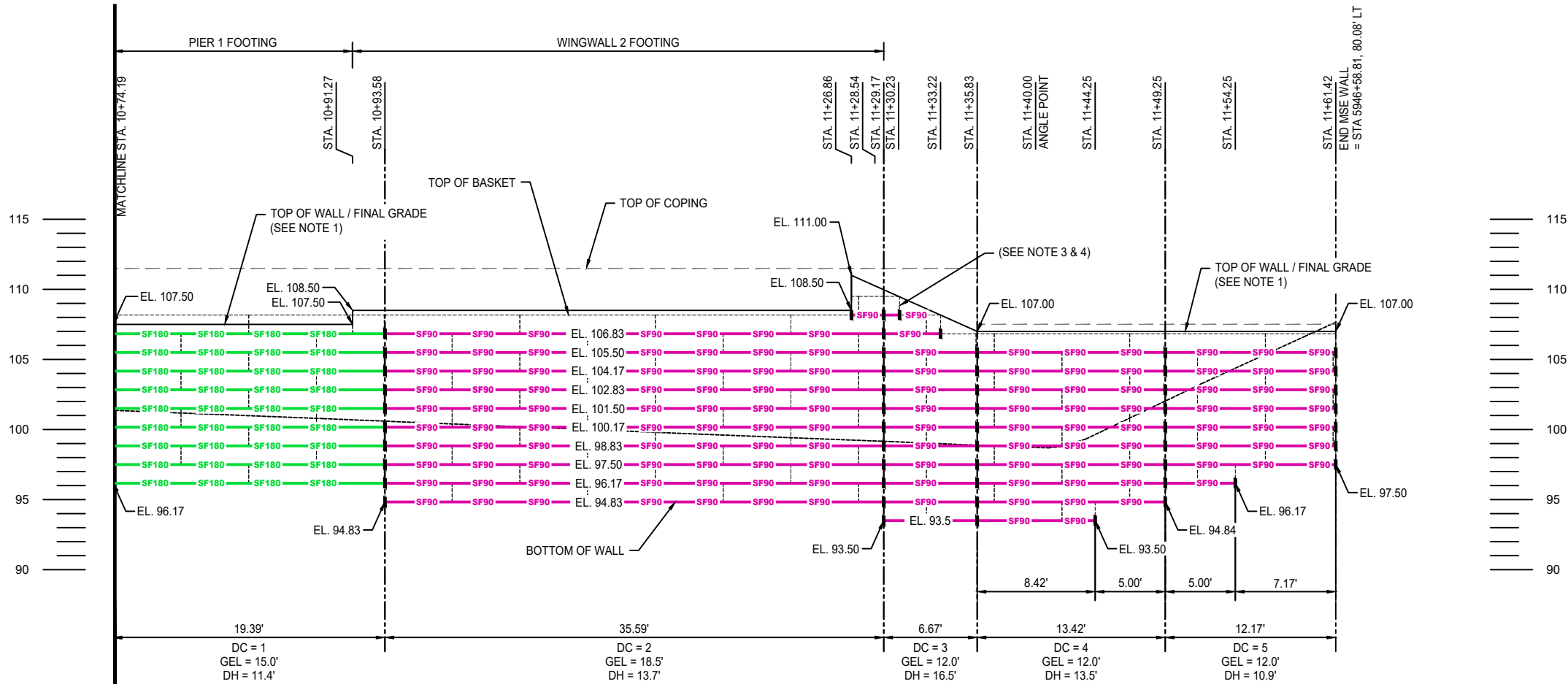
DOCUMENT REVIEW

- ☒ APPROVED, NO EXCEPTION TAKEN
☐ APPROVED AS NOTED
☐ RESUBMIT, REVISE AS NOTED

REVIEWED BY: E. Ferluga DATE: 12/10/21

B. Exley **12/10/21**

Review is for general conformance with contract or design documents. Sole responsibility for correctness of dimensions, details, quantities, materials, and safety during fabrication and erection shall remain with the contractor.

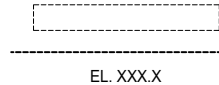


DC = DESIGN CASE
GEL = GEOGRID EMBEDMENT LENGTH (FEET)
DH = DESIGN HEIGHT (FEET)

NOTES:

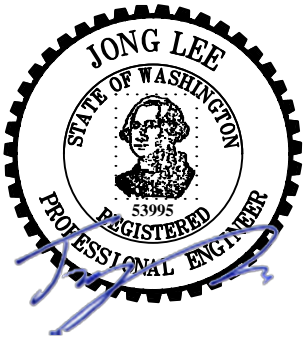
- INSTALLER SHALL NEST FACING UNITS AT THE TOP OF MSE WALL TO MATCH THE PROPOSED FINISHED GRADE SHOWN. REFER TO NESTING BASKET DETAILS.
- WALL GEOMETRY IS GENERATED BASED ON CONTRACT PLANS TITLED "I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT", BRIDGE SHEET NO. BR5, SHEET NO. 5. PROJECT ENGINEER SHALL VERIFY WALL GEOMETRY PRIOR TO CONSTRUCTION.
- INSTALLER MAY TRIM WWF FACING UNITS 6" BELOW FINISHED GRADE LINE, MAINTAIN A MINIMUM OF 6" SOIL COVER ABOVE WWF FACING UNIT AND GEOSYNTHETICS OR INSTALLER MAY INSTALL WWF FACING UNITS AS SHOWN ABOVE AND AS SHOWN IN TOP OF MSE STRUCTURE FINISHING DETAIL.
- RETURN FACING MATERIALS INTO FILL TO CONTAIN REINFORCED BACKFILL.
- WWF FACING UNITS SHALL BE NESTED 2" TO ACHIEVE 16" GEOGRID SPACING. ADDITIONAL NESTING MAY BE REQUIRED AT THE TOP OF THE WALL TO ACCOMMODATE THE FINISHED GRADE SURFACE WHICH SHALL BE A 6" MINIMUM ABOVE WWF FACING UNITS AND GEOSYNTHETICS.

ELEVATION VIEW - WALL 12.18 (2 OF 2)
ALONG FRONT FACE OF MSE STRUCTURE



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OWNER PROJECT No. C9242

CLIENT

FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
336-830-0226

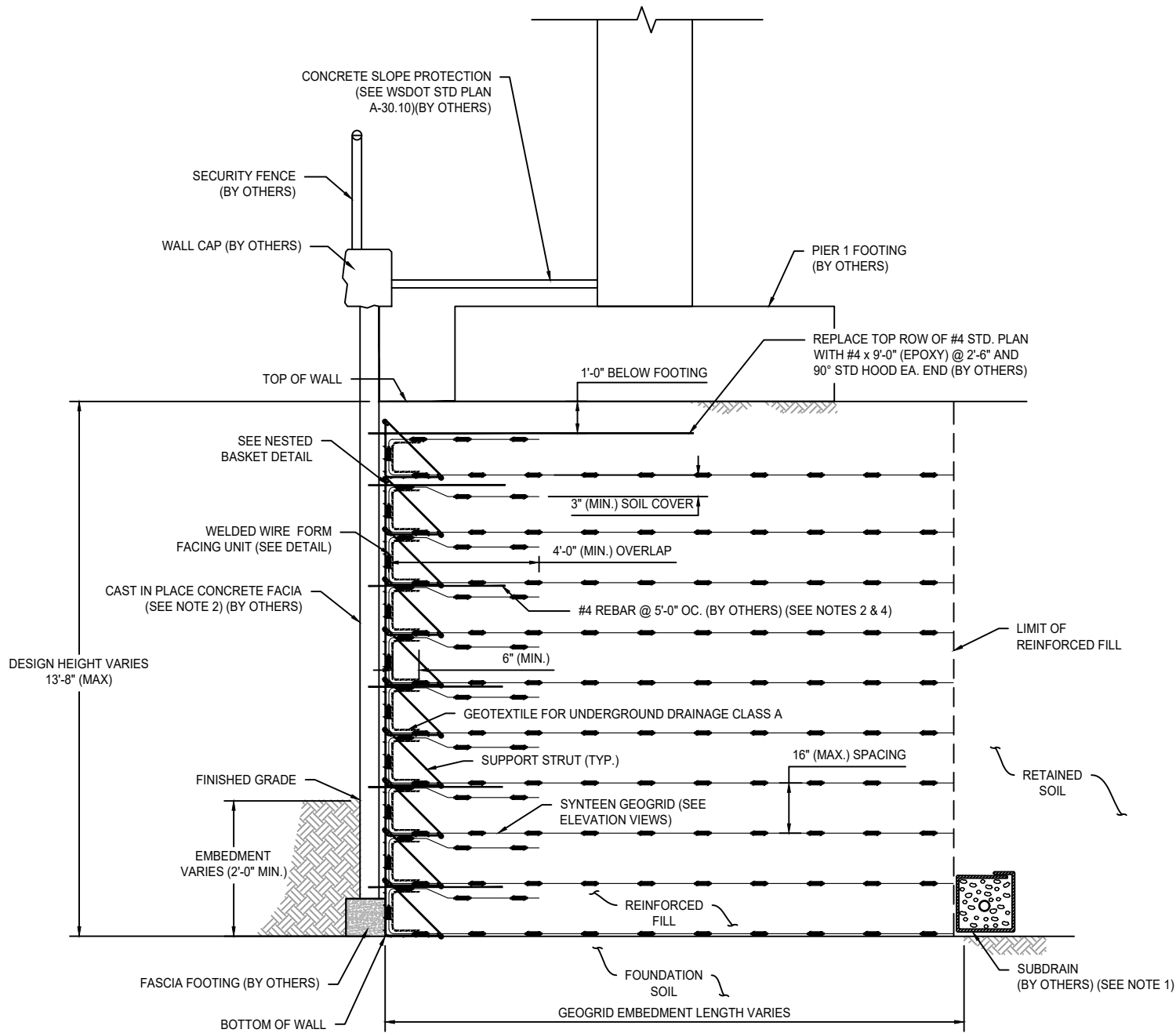
DRAWN BY: O. MARTINEZ
DESIGNED BY: V. AMAYA
CHECKED BY: R. JOHNSON
ENGINEER OF RECORD (MSE STRUCTURE ONLY):
JONG LEE P.E. NO. 53995

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SHEET TITLE

**TYPICAL CROSS-SECTION
AT BRIDGE AND WING WALL
FOOTINGS**

SHEET 6 OF 9



NOTES:

1. DRAINAGE COMPONENTS ARE SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO CONTRACT PLANS FOR MORE INFORMATION. INTERNAL DRAINAGE SHALL BE EVALUATED AND RECOMMENDED BY THE PROJECT GEOTECHNICAL ENGINEER. DESIGN AND EVALUATION OF THE DRAINAGE SYSTEM IS OUTSIDE THE SCOPE OF TIC'S RESPONSIBILITY.
2. REFER TO WSDOT STANDARD DETAILS D-3.09.00 AND D-3.10-01 FOR CAST-IN-PLACE PERMANENT GEOSYNTHETIC WALL FASCIA AND FACING FOR INSTALLATION GUIDANCE AND MORE INFORMATION.
3. WWF FACING UNITS SHALL BE NESTED 2" TO ACHIEVE 16" GEOGRID SPACING. ADDITIONAL NESTING MAY BE REQUIRED AT THE TOP OF THE WALL TO ACCOMMODATE THE FINISHED GRADE SURFACE WHICH SHALL BE 6" MINIMUM ABOVE WWF FACING UNITS AND GEOSYNTHETICS.
4. FIELD CUT WWF FACING UNITS FOR CLOSE FIT AROUND REBAR AND ANCHORS.

TYPICAL CROSS-SECTION AT BRIDGE AND WING WALL FOOTINGS

NOT TO SCALE

I-405, Renton to Bellevue Widening & and Express Toll Lanes Project

DOCUMENT REVIEW

- ☒ APPROVED, NO EXCEPTION TAKEN
☐ APPROVED AS NOTED
☐ RESUBMIT, REVISE AS NOTED

REVIEWED BY: E. Ferluga DATE: 12/10/21

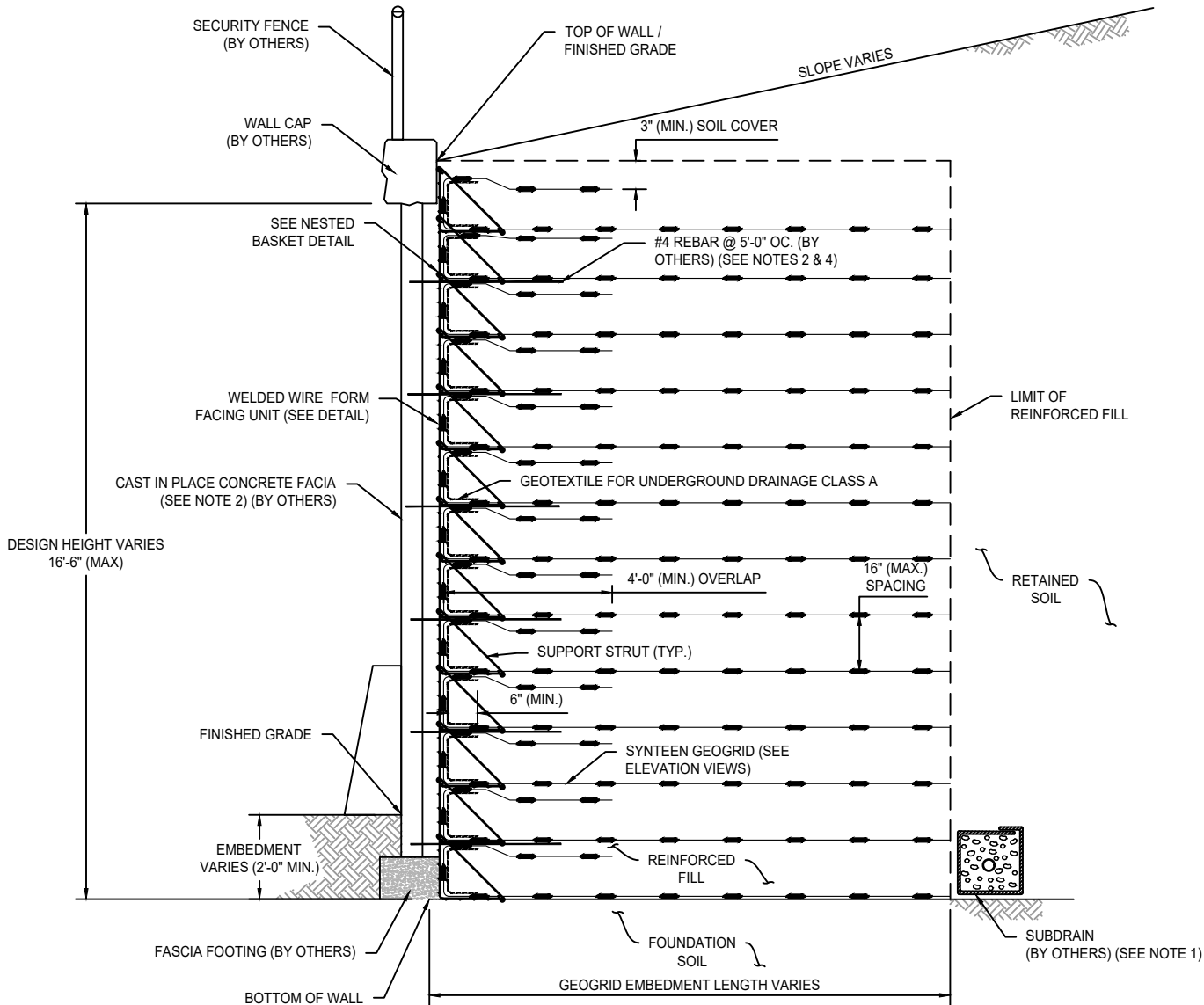
B. Exley 12/10/21

Review is for general conformance with contract or design documents. Sole responsibility for correctness of dimensions, details, quantities, materials, and safety during fabrication and erection shall remain with the contractor.

Plotted on: December 9, 2021
K:_D\38650\FINAL\WORKING FILES\DRAWINGS\REV2\038650_XS.DWG

NOTES:

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- WWF FACING UNITS SHALL BE NESTED 2" TO ACHIEVE 16" GEOGRID SPACING. ADDITIONAL NESTING MAY BE REQUIRED AT THE TOP OF THE WALL TO ACCOMMODATE THE FINISHED GRADE SURFACE WHICH SHALL BE 6" MINIMUM ABOVE WWF FACING UNITS AND GEOSYNTHETICS.
- FIELD CUT WWF FACING UNITS FOR CLOSE FIT AROUND REBAR AND ANCHORS.



TYPICAL CROSS-SECTION BEYOND WING WALL FOOTINGS
NOT TO SCALE

I-405, Renton to Bellevue Widening & and Express Toll Lanes Project

DOCUMENT REVIEW

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- ☐ APPROVED AS NOTED
- ☐ RESUBMIT, REVISE AS NOTED

REVIEWED BY: E. Ferluga DATE: 12/10/21
B. Exley **12/10/21**

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Tensar.

Tensar International Corporation
2500 Northwinds Parkway | Suite 500
Alpharetta, Georgia 30009 | 770-344-2090

C.O.A. NO. 2465

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PROJECT NAME AND LOCATION

**I-405; RENTON TO
BELLEVUE WIDENING AND
EXPRESS TOLL LANES
PROJECT - WALL 12.18**

KING COUNTY, WA

OWNER
WSDOT

OWNER PROJECT No. C9242

CLIENT
FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
336-830-0226

TIC PROJECT No. 038650

DRAWN BY: O. MARTINEZ

DESIGNED BY: V. AMAYA

CHECKED BY: R. JOHNSON

ENGINEER OF RECORD (MSE STRUCTURE ONLY):
JONG LEE P.E. NO. 53995

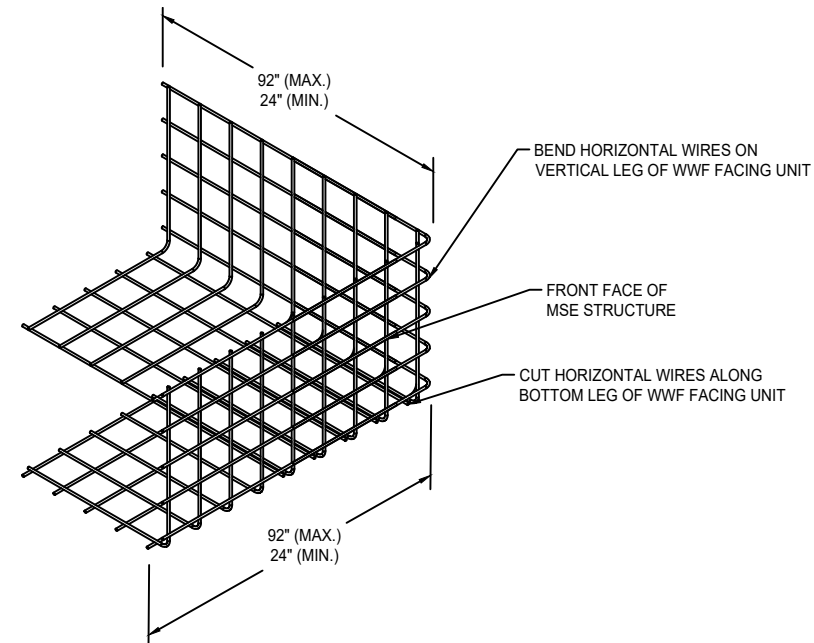
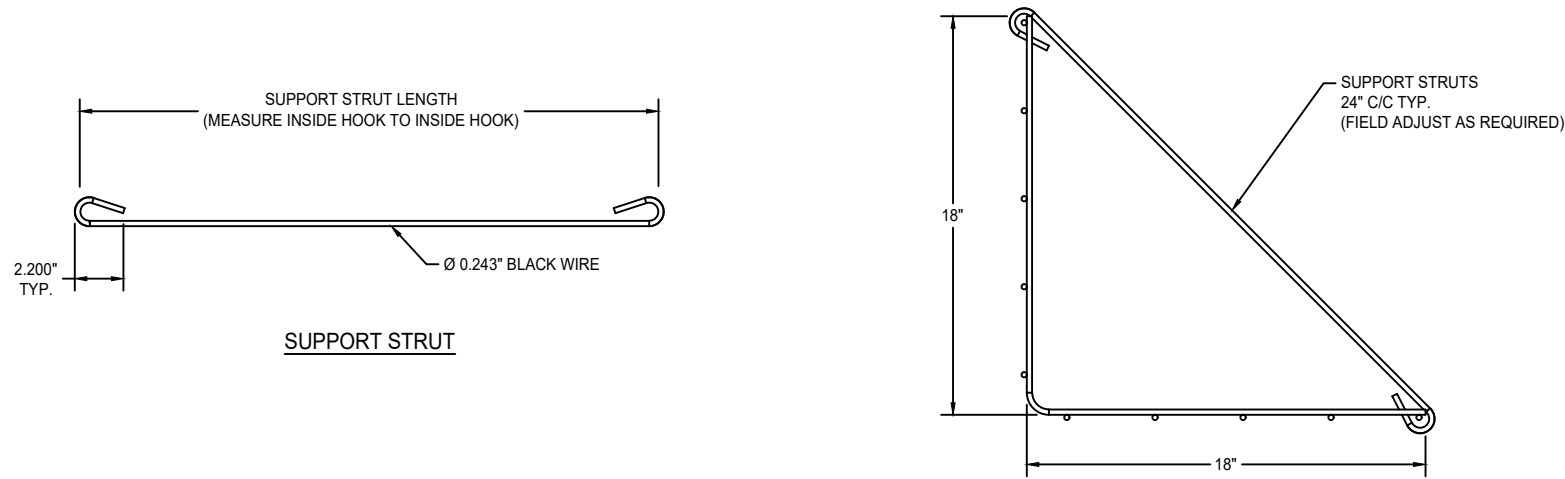
2	12/8/2021	NO CHANGES	VA
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0	10/12/2021	ISSUED FOR REVIEW	VA
NO.	DATE	DESCRIPTION	BY

REVISION / ISSUE

SHEET TITLE

**TYPICAL CROSS-SECTION
BEYOND WING WALL
FOOTINGS**

Plotted on: December 8, 2021
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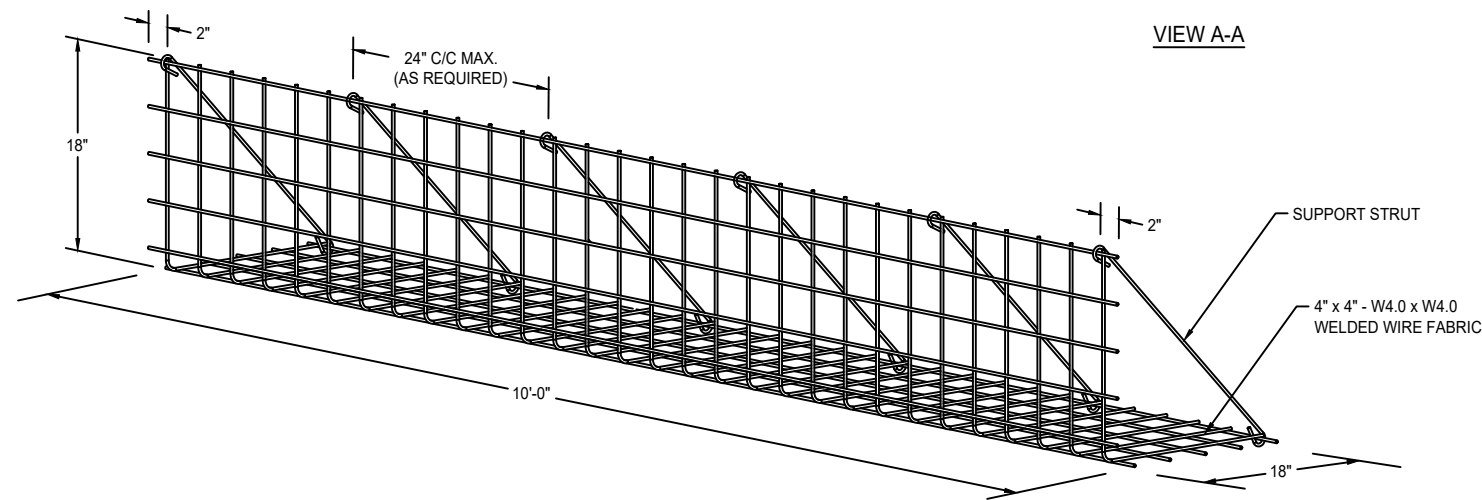


NOTES:

1. MAINTAIN 24" (MIN.) OF WIRE FORM ON EACH SIDE OF BEND.
2. SEE WELDED WIRE FORM (WWF) FACING UNIT DETAIL FOR FACING MATERIAL AND DIMENSIONS.

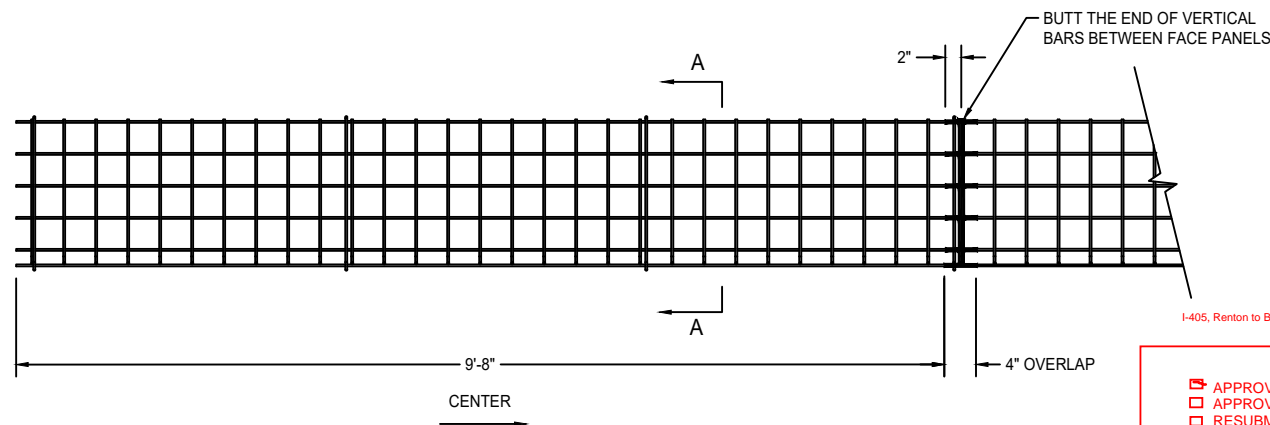
WELDED WIRE FORM OUTSIDE CORNER UNIT

NOT TO SCALE



NOTES:

1. FACING TO CONSIST OF PREFABRICATED WWF 4" x 4" - W4.0 x W4.0 FORMS.
2. ALL FORMS AND STRUTS WILL BE FABRICATED WITH BLACK WIRE.
3. OVERALL LENGTH OF WIRE FORMS IS 10'-0". EFFECTIVE CONSTRUCTED WIDTH IS 9'-8" WITH 4" OVERLAPPING AT ENDS.



WELDED WIRE FORM FACING UNIT

NOT TO SCALE

I-405, Renton to Bellevue Widening & Express Toll Lanes Project

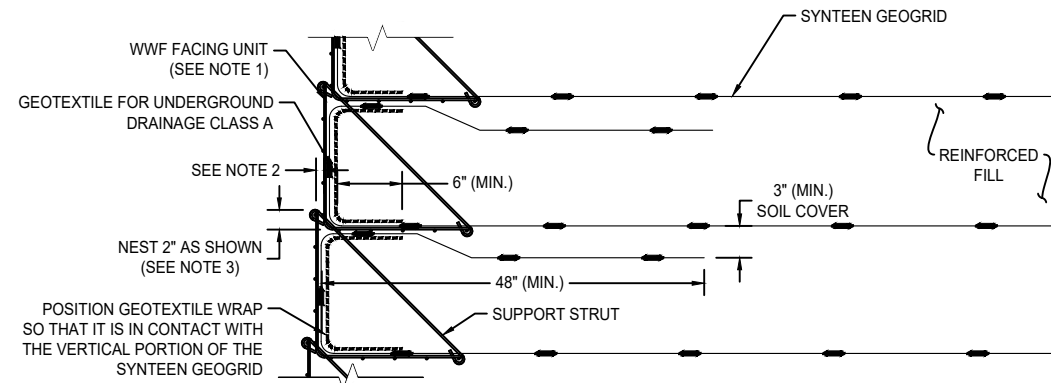
DOCUMENT REVIEW

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REVIEWED BY: E. Ferluga DATE: 12/10/21

B. Exley 12/10/21

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CROSS-SECTION

NOTE:

1. SEE WELDED WIRE FORM (WWF) FACING UNIT DETAIL FOR FACING MATERIAL AND DIMENSIONS.
2. OFFSET AS NEEDED TO ACHIEVE OVERALL BATTER AS SHOWN IN THE CROSS-SECTIONS.
3. BASKETS SHALL BE NESTED 2" TO ACHIEVE 16" GEOGRID SPACING.

WELDED WIRE FORM FACING DETAIL (SYNTEEN WRAP)

NOT TO SCALE

Tensar.

Tensar International Corporation
2500 Northwinds Parkway | Suite 500
Alpharetta, Georgia 30009 | 770-344-2090

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PROJECT NAME AND LOCATION
I-405; RENTON TO BELLEVUE WIDENING AND EXPRESS TOLL LANES PROJECT - WALL 12.18

KING COUNTY, WA

OWNER
WSDOT

OWNER PROJECT No. C9242

CLIENT
FLATIRON-LANE J.V.
1400 TALBOT RD S, SUITE 500
RENTON, WA 98055
336-830-0226

TIC PROJECT No. O38650

DRAWN BY: O. MARTINEZ

DESIGNED BY: V. AMAYA

CHECKED BY: R. JOHNSON

ENGINEER OF RECORD (MSE STRUCTURE ONLY):
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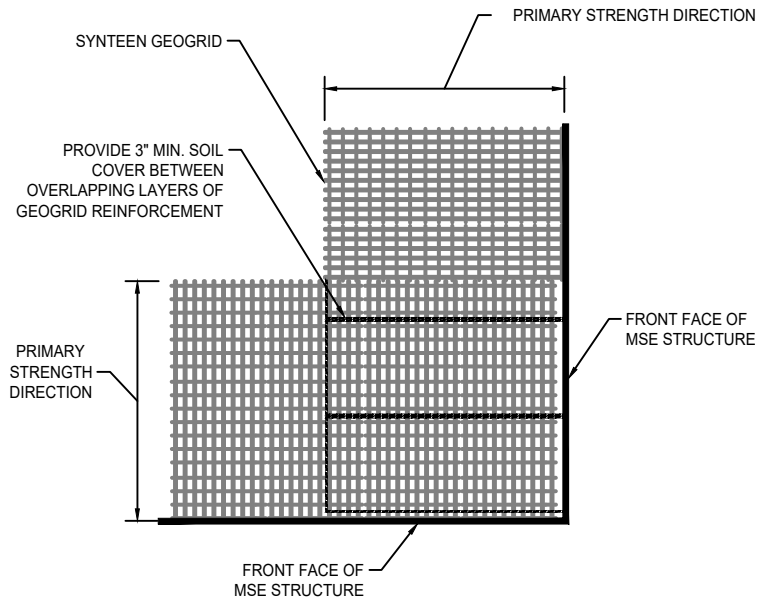
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REVISION / ISSUE

SHEET TITLE

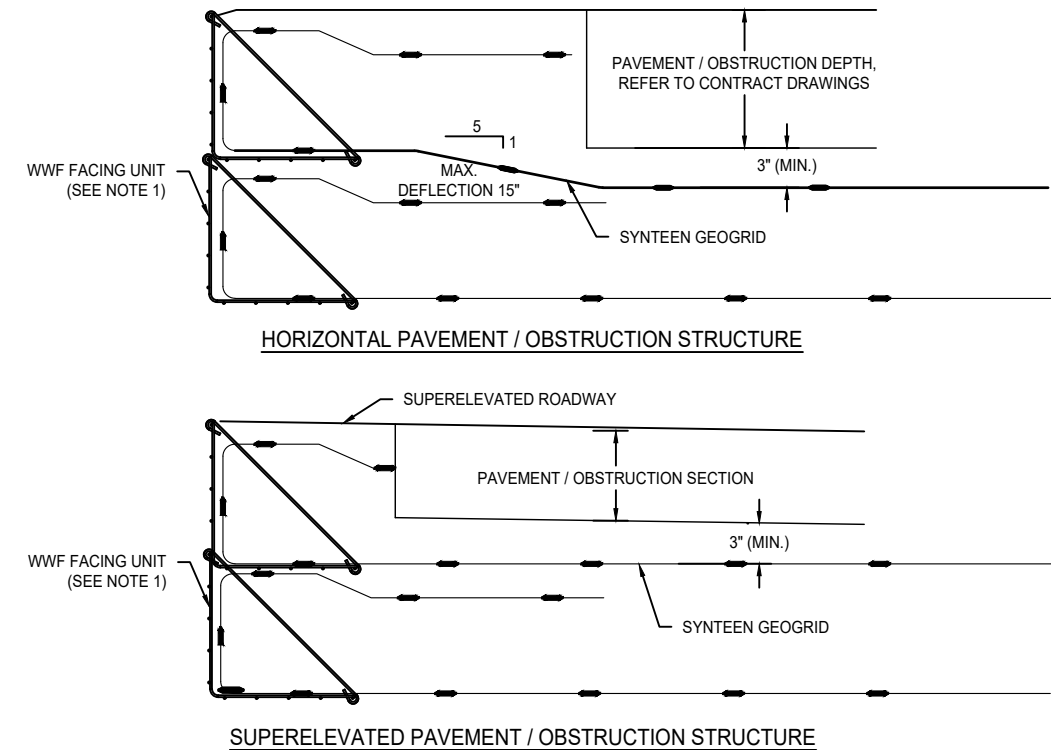
TYPICAL DETAILS (1 OF 2)

Plotted on: December 9, 2021
K:_D\38650\FINAL WORKING FILES\DRAWINGS\REV2\38650_ID.DWG



PLAN VIEW

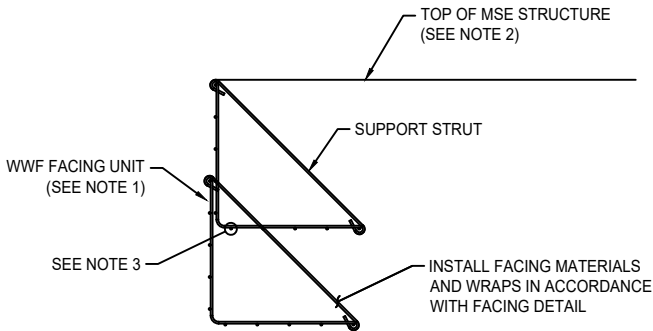
GEOGRID PLACEMENT AT OUTSIDE CORNER DETAIL
NOT TO SCALE



NOTES:

1. SEE WELDED WIRE FORM (WWF) FACING UNIT DETAIL FOR FACING MATERIALS AND DIMENSIONS.
2. CONTRACTOR IS RESPONSIBLE TO COORDINATE THE PLACEMENT OF THE GEOGRID TO AVOID CONFLICT WITH THE CONTRACT PAVEMENT/OBSTRUCTION SECTION. GEOGRID MUST BE SEPARATED FROM THE PAVEMENT/OBSTRUCTION SECTION BY A MINIMUM OF 3".

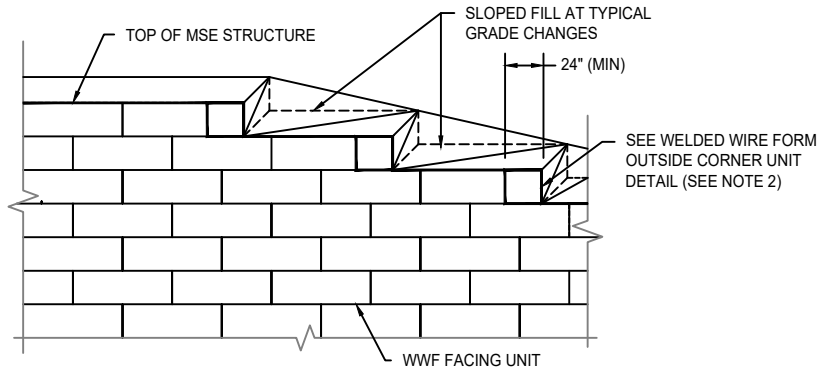
GEOGRID PLACEMENT AT PAVEMENT/OBSTRUCTION SECTION
NOT TO SCALE



NOTES:

1. SEE WELDED WIRE FORM (WWF) FACING DETAIL FOR FACING MATERIALS AND DIMENSIONS.
2. SET TOPMOST WWF FACING UNIT INSIDE WWF FACING UNIT BELOW TO FOLLOW GRADE.
3. HORIZONTAL WIRES OF TOPMOST WWF FACING UNIT MAY BE CUT TO ALLOW INSTALLATION OVER STRUTS OF WWF FACING UNIT BELOW.

NESTED BASKET DETAIL (NO OFFSET)
NOT TO SCALE



NOTES:

1. SEE WELDED WIRE FORM (WWF) FACING DETAIL AND WWF OUTSIDE CORNER UNIT DETAIL FOR FACING MATERIALS AND DIMENSIONS.
2. BEND BASKET 90° PER OUTSIDE CORNER UNIT DETAIL AT STEPS TO ENSURE REINFORCED FILL IS CONTAINED.

TOP OF MSE STRUCTURE FINISHING DETAIL (NO OFFSET)
NOT TO SCALE

Tensar.

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TYPICAL DETAILS (2 OF 2)